Site Seeing
Intermediate Level

Purpose

To introduce students to the concept of a system. The supporting concepts are boundaries, inputs, outputs, and feedback loops. The concept of a system will help students understand why they are conducting the biometry measurements on the 30 x 30 m Biology Study Site. Students investigate the idea that every dynamic system has energy and matter. Inputs and outputs will vary depending upon the physical components of the site, the plant and animal life, the determined boundaries or scale of the study and the season of the year.

Overview

The intermediate level of Site Seeing builds upon the concepts presented in the beginning level. The class will travel to several different study sites including their 30 x 30 m Biology Study Site. At each site, students will explore a larger variety of system inputs and outputs, and will use more complex methods of data acquisition and analysis. The students will use the data from each site to compare and contrast the inputs and outputs of the environments.

Time

Three class periods

Level

Intermediate

Key Concepts

- System boundaries will differ depending upon the question you are asking.
- Systems contain certain elements such as trees, water, soil, rocks, and animals.
- Systems have inputs such as sun's energy, water, carbon dioxide, oxygen, dust.
- Systems have outputs such as water, carbon dioxide, oxygen, and heat.

Skills

- *Observing* the components of the system and the inputs and outputs of the system
- *Measuring* inputs and outputs of the system
- *Collecting* data from the system
- *Interpreting* the data collected about the various systems studied

Materials and Tools

- String
- 30 x 30 m Biology Study Site
- Thermometers
- Rain gauges
- Plastic sandwich bags
- GLOBE Science Notebooks
- Biology Field Site Work Sheet
- Beaufort Scale Work Sheet
- Heavy paper cup
- Paper

Preparation

Use string to mark the borders of the 30 m x 30 m Biology Study Site.

Collect the data listed below at three different sites within your GLOBE Study Site– an open place such as a field or playground, near open water, and your Biology Study Site. Plan to visit the sites on the same day or on different days at about the same time.

Obtain necessary permission to visit the chosen sites, and check them for any safety hazards. Arrange for parents or other volunteers to accompany students to the sites.

You can use the Site Seeing Biology Field Site work sheet for students to record the data. Divide the class into three teams composed. Students should take the materials listed above and proceed with their missions at all three sites as follows.

Prerequisites

The rationale for the biometry protocol measurements on their 30 m x 30 m Biology Study Site.

The Beginning activity is recommended. If not used, students should understand the concept of system boundaries.

What To Do and How To Do It

1. Temperature – Ask the teams to measure each site's temperature at ground level, 2.5 cm deep in the soil, and at 0.5 m above the ground. To get the temperature of the soil below ground, carefully insert the tip of the thermometer into the ground. To get the temperature at or above ground level, you should insert the thermometer through a hole in the bottom of an upside-down heavy paper cup. The cup acts as a shield around the tip of the thermometer so that direct sunlight and other extraneous sources of heat do not cause inaccurate readings. The thermometer should be remain in one location until the temperature does not vary for 1-2 minutes.
2. Precipitation– What is the amount of rain during the last growing season? If you don't use the rain gauge from GLOBE, you can get the information from a meteorologist. A high school could use the GLOBE soil moisture of the area. Has it rained lately? What evidence is there – lakes, streams, water retainment areas, puddles?
   Have the students place a plastic sandwich bag over some living green leaves. Leave in place overnight. How much moisture is in the bag? Where did it come from? Where is it going?
3. Sunlight – When the sun is shining, look around your study site for signs of sunlight on the trees and on the ground. How much sunlight reaches the top of the trees? How much is reaching the ground? If sunlight is being absorbed by the plant, what happens to the sunlight? Is it being reflected (that means the leaves would be shiny and reflective like aluminum foil)?
   Note: Students will think that plants get their food from the soil and will not think the sun is used to make food during photosynthesis. They will think that sun helps plants to grow, but not sure how or why. Question students on how plants use sunlight in their life cycle?
4. Wind – How much wind is blowing in the sites? Are the leaves shaking in the breeze? Is the wind strong enough to bend small branches? Large branches? Have the students use a piece of paper as a temporary wind sock. See the Beaufort Scale Work Sheet. One student can hold the paper away from the body, while the others observe whether it hangs straight down or blows out at an angle. Have the students use the compass to determine from which direction the wind seems to be blowing.
5. Animal Life – Ask the teams to note the various kinds of animals at each site (insects, birds, reptiles, fish, frogs, or tadpoles). Students should record evidence of animals such as scat, tracks, burrows, or chewed leaves. Estimate the population of each animal type. Which is the most dominant?
6. Plant Life – Ask the teams to observe the various types of plants at each site (large trees, small trees, shrubs, small plants, grasses). Suggest that they record the most common types of plants found in each location. Estimate the population of each plant type? Which is the most dominant?
7. After the teams have had sufficient time to investigate each site, have them report their findings and share what they have learned. After listening to each other's reports, the class can complete a large composite class chart. Use this composite chart as a basis for discussing differences between the locations and interactions the students observe among the various elements.

Discussion Questions

1. How do the various sites differ in numbers or diversity of species of animals and plants? How are they different?
2. Which site had the highest air temperature? The lowest? The most wind? The least wind?
3. What relationship does light seem to have with air temperature? With soil moisture? With plants?
4. Which of the six variables studied seems most important for determining the character of the environment at each site? What makes you think so?
5. What are the inputs to the various systems? Which factors are outputs? Which of the six elements stays within the system? They can draw a picture or a flow chart of their sites.
6. Have students draw diagrams of their systems or make up a story about their system tracing the path of the sun through the system.

Further Investigations

1. Visit the sites selected in the Intermediate activities again at different seasons and repeat the investigation. How have the various factors changed? What factors influenced the change? What factors might have influenced the leaf on or off process during the course of the year?
2. Have students construct terrariums. Try to make the terrarium more like one of your above system sites. Add wind, moderate the temperature, water, and check for sunlight, add plants, mimic animal effects. Try to model your system based upon the data you received from your investigation. Try for seasonal variations. Can you do it? What limitations are there to the models? Can you develop the same cycles that exist in nature between the living and nonliving factors?

Figure LAND-L-32: Site Seeing - Biology Study Site Sketch Work Sheet

Date:

Name(s):

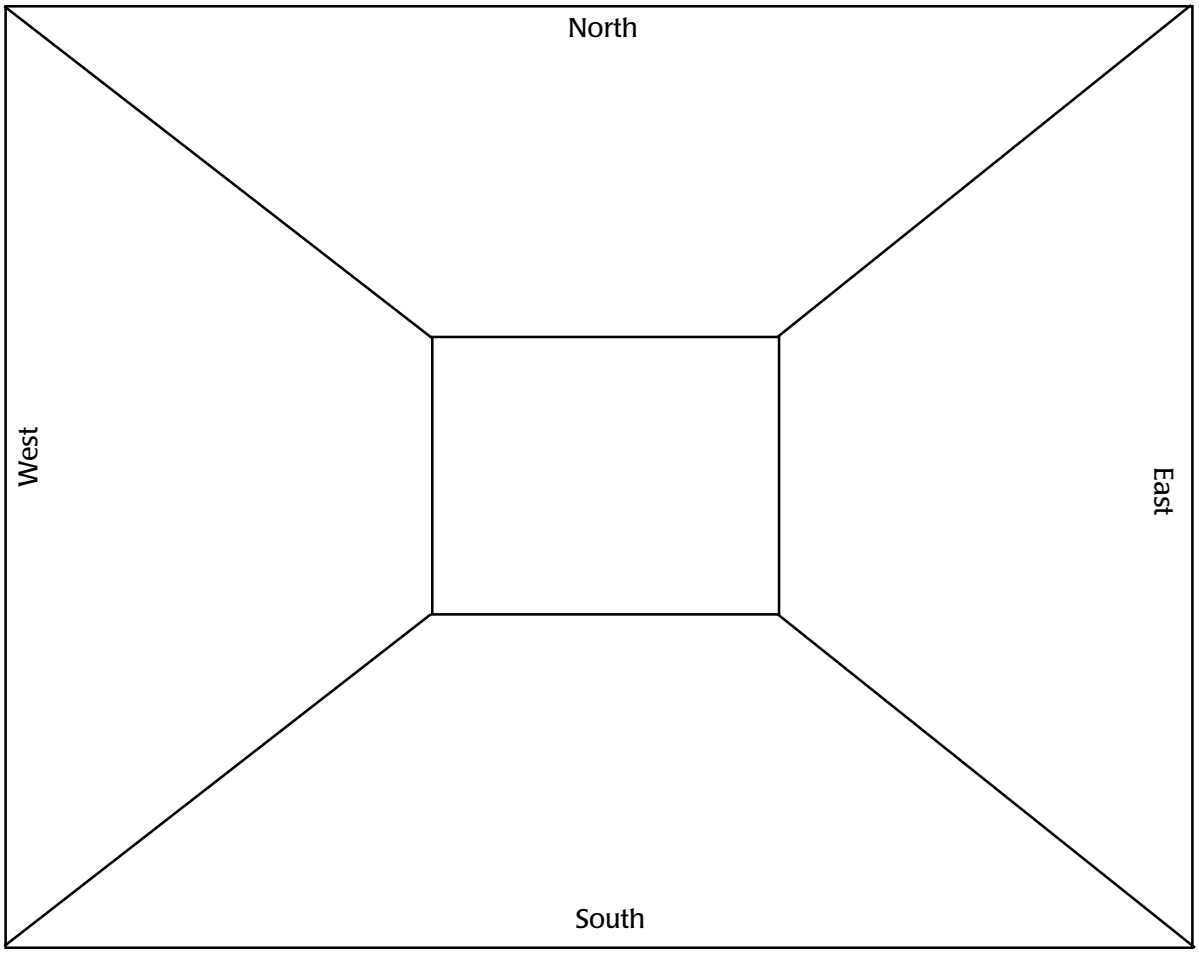

Figure LAND-L-33: Site Seeing - Biology Field Site Work Sheet

Site Seeing
Biology Field Site Work Sheet

Date: **Name:**

Study Site Type (circle one): Wetland Field 30 x 30 m Biology Study Site

Temperature (C) at: 0.5 m elevation:

Ground Level:

2.5 cm Depth:

Accumulated precipitation from the growing season (mm):

Sunlight:

Wind (Beaufort Scale):

Animal and Plant Life:

Table LAND-L-16: Beaufort Scale Work Sheet

Wind Speed kmph	Wind Speed mph	Beaufort Number	Wind Description	Observed Effects on Land
<1	<1	0	Calm	Calm, no movement of leaves
1–3	1–3	1	Light air	Slight leaf movement, smoke drifts, wind vanes moving
6–11	4–7	2	Light breeze	Leaves rustling, wind felt, wind vanes moving
12–19	8–12	3	Gentle breeze	Leaves and twigs in motion, small flags and banners extended
20–29	13–18	4	Moderate breeze	Small branches moving; raising dust, paper litter, and dry leaves
30–38	19–24	5	Fresh breeze	Small trees and branches swaying, wavelets forming on inland water ways
39–49	25–31	6	Strong breeze	Large branches swaying, overhead wires whistling, difficult to control an umbrella
50–61	32–38	7	Moderate gale	Entire trees moving, difficult of walk into wind
62–74	39–46	8	Fresh gale	Small branches breaking, difficult to walk, moving automobiles drifting and veering
75–87	47–54	9	Strong gale	Roof shingles blown away, slight damage to structures, broken branches littering the ground
88–101	55-63	10	Whole gale	Uprooted and broken trees, structural damage
102–116	64–73	11	Storm	Widespread damage to structures and trees, a rare occurrence
>117	>74	12–17	Hurricane	Severe to catastrophic damage